

## PATENT ABSTRACTS OF JAPAN

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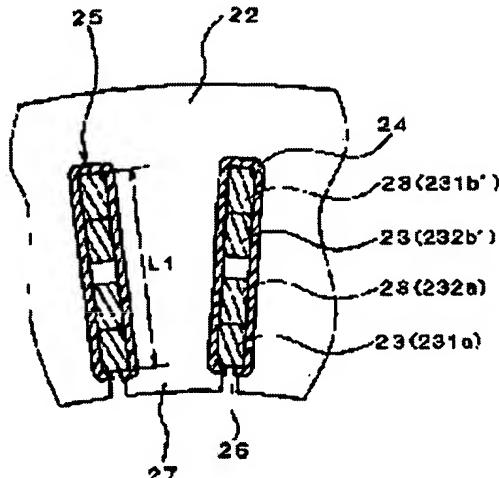
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## (54) AC GENERATOR FOR VEHICLE AND MANUFACTURE OF ITS STATOR

## (57)Abstract:

PROBLEM TO BE SOLVED: To reduce magnetic noise and improve an environment resisting property.

SOLUTION: An iron core 22 of a stator is provided with a plurality of slots 25. In each of the slots 25, a plurality of conductors, for example four conductors, which constitutes a stator winding are housed. By disposing part of the conductors to the inner side, an opening 26 of the slot 25 which opens to the inner side is closed by those conductors. At the same time, a space between the ends of two protrudent parts near the opening is bridged and thereby the circumferential rigidity is increased.



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## CLAIMS

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### [Claim(s)]

[Claim 1] it has the stator core which has two or more slots, and the stator winding with which the aforementioned stator core was equipped, and two or more conductors which form the aforementioned stator winding open and hold a crevice in the aforementioned slot -- having -- \*\*\*\* -- the above of at least a part -- the AC generator for vehicles characterized by arranging the conductor at the inner circumference side within the aforementioned slot

[Claim 2] in a claim 1, the aforementioned stator core has the teeth inserted into the two adjoining aforementioned slots, and constructs a bridge in between the points of the two adjoining aforementioned teeth -- as -- the above -- the AC generator for vehicles characterized by arranging the conductor

[Claim 3] claims 1 or 2 -- setting -- the above -- the AC generator for vehicles characterized by for the conductor having the conductor width almost equal to the width of face of the hoop direction of the aforementioned slot, and being arranged and contained by the single tier along the direction of a path of the aforementioned slot

[Claim 4] In either of the claims 1-3 the aforementioned stator winding the conductor of the shape of two or more U character -- the above by the side of the inner layer which is formed by joining the edge of a segment and was held in each aforementioned slot -- the above by the side of a conductor and an outer layer -- by forming a predetermined crevice between conductors two or more above within the aforementioned slot -- the AC generator for vehicles characterized by having distributed the conductor within and without within the aforementioned slot, and having arranged it

[Claim 5] the conductor of the shape of U character which has latus width of face rather than the depth which met in the direction of a path of the slot of a stator core -- the process which fabricates a segment, and the above -- a conductor -- the manufacture method of the stator of the AC generator for vehicles characterized by having the process which puts a segment from the shaft orientations of the aforementioned stator core to the aforementioned slot

[Claim 6] the above before being put in the aforementioned slot in a claim 1 -- a conductor -- the width of face to which, as for the segment, the width of face of the direction of a path of both by the side of a turn and a nose of cam met in the direction of a path of the aforementioned slot -- latus -- the manufacture method of the stator of the AC generator for vehicles characterized by things

[Claim 7] claims 5 or 6 -- setting -- the above -- a conductor -- after putting a segment in the aforementioned slot -- the above -- a conductor -- the manufacture method of the stator of the AC generator for vehicles characterized by having the process which extends the nose-of-cam side of a segment

[Claim 8] the conductor of the shape of U character put in the slot of a stator core -- the manufacture method of the stator of the AC generator for vehicles characterized by having the process which extends the nose-of-cam side of a segment

[Claim 9] the above which the number of the conductors within the aforementioned slot is four, and projects from the aforementioned stator core in claims 7 or 8 -- a conductor -- the edge of a segment -- the above -- the manufacture method of the stator of the AC generator for vehicles characterized by

having the process which it joins at a time about two inside and outside which met in the direction of a path of a conductor

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the AC generator for vehicles carried in a passenger car, a truck, etc.

[0002]

[Description of the Prior Art] In recent years, the engine noise is falling and a magnetic noise (magnetic sound) of the AC generator for vehicles has become jarring from the social request of the noise reduction outside a vehicle, or the aim on the goods disposition by the vehicle indoor quiet disposition top in connection with this. Moreover, it is in the inclination for the output of the AC generator for vehicles to also increase and for magnetic sound to increase with the increase in the output current by increase of the latest electric load.

[0003] By the way, the copper wire with which the conventional AC generator for vehicles has a circular cross section as a stator winding is used, and the stator is constituted by containing this stator winding in the slot formed in the inner circumference side of a stator core in a circle. For example, in the drawing 7, a stator coil is contained in a slot and the stator equipped with the wedge in slot opening is indicated by JP,7-231591,A.

[0004]

[Problem(s) to be Solved by the Invention] In the stator of the conventional AC generator for vehicles indicated by JP,7-231591,A mentioned above, since the teeth nose of cam of a stator core turned into the free end of vibration, the rigidity of a circumferential direction was low, the rotator of the AC generator for vehicles rotated, these teeth tended to vibrate with vibration of a stator winding at a hoop direction during power generation operation, and there was a problem that magnetic sound became large.

[0005] Moreover, it is more desirable for the stator indicated by the official report mentioned above to delete this wedge, in order to reduce part mark and an attachment man day, although the wedge is prepared so that a stator winding may not jump out to an inner circumference side. However, if this wedge was deleted, since salt water, electrolysis water or muddy water, etc. would become easy to invade from an inner circumference side, there was a problem that a resistance to environment got worse. In the AC generator for vehicles of an inner fan type with which the cooling fan was especially fixed to the end face of a rotator, if a rotator rotates, since the cooling wind which goes in the centrifugal direction with a cooling fan will occur, the pressure near the inner circumference side opening of a slot becomes high. Therefore, since the salt water incorporated from [ both ] the outside as the style of cooling trespasses upon the crevice between the stator windings within a slot easily from slot opening, the insulator which intervenes between an insulating coat, and the slot wall section and the stator winding which it becomes easy to corrode a stator coil or the slot wall section, and were formed in the stator coil front face may be torn, and the short circuit between stator coils or between a fixed coil and a stator core may be caused.

[0006] this invention is created in view of such a point, and the purpose can reduce generating of magnetic sound and is to offer the AC generator for vehicles which can raise a resistance to

environment.

[0007]

[Means for Solving the Problem] in order to solve the technical problem mentioned above -- the AC generator for vehicles of this invention -- a part of stator winding [ at least ] -- the inner circumference side of the slot of a stator core -- arranging -- \*\*\*\* -- the conductor near the slot opening -- since a teeth nose of cam stops being able to vibrate easily by making density dense and restraining teeth noses of cam to a hoop direction, increase of the magnetic sound by vibration of a stator winding can be prevented Moreover, since inner circumference side opening of a slot is blockaded by the stator winding by arranging a stator winding at the inner circumference side of a slot, it can prevent that water invades from an inner circumference side in a slot, generating with a poor insulation attracted by the water entry can be avoided, and a resistance to environment can be raised.

[0008] Moreover, it is desirable to arrange the conductor of a stator winding to the inner circumference side of a slot so that a bridge may be constructed in between two adjoining teeth noses of cam. Thus, while the rigidity of the hoop direction at the nose of cam of teeth increases by arranging a conductor, the water-entry way which leads into a slot from slot opening can be intercepted.

[0009] Moreover, it is desirable to form in a conductor width almost equal to the width of face of the hoop direction of a slot the conductor mentioned above, to arrange to a single tier along the direction of a path, and to contain in a slot. By carrying out \*\*\*\* coincidence of the width of face of a slot, and the width of face of a conductor, it becomes easy to blockade inner circumference side opening of a slot and to construct a bridge by the conductor in teeth noses of cam.

[0010] furthermore, the stator winding mentioned above -- the conductor of the shape of two or more U character -- the inner layer which formed by joining the edge of a segment and was contained by each slot, and an outer layer -- each -- between conductors -- a crevice -- forming -- the inside of a slot -- each -- it is desirable to distribute a conductor a U character-like conductor -- the inner layer held in one slot by forming a crevice in a part for the center section of two or more conductors within the slot offered by the segment, and an outer layer -- each -- since the energization force can be produced in the direction which a conductor leaves -- vibration of a teeth nose of cam -- the conductor by the side of a inner layer -- it becomes possible to suppress by the segment and it can suppress that an addendum section nose of cam vibrates with vibration of a stator winding

[0011] moreover, the conductor of the shape of U character which has latus width of face rather than the depth to which the manufacture method of the stator of the AC generator for vehicles of this invention met in the direction of a path of a slot -- the process which fabricates a segment, and this conductor -- it has the process which puts a segment from the shaft orientations of a stator core to a slot the depth of a slot -- width of face -- latus -- a conductor -- since each of the conductor within a slot has non-influence in an inner circumference and periphery side and is arranged by putting a segment in a slot, it becomes easy to arrange a part of conductor to an inner circumference side

[0012] especially -- the inside of a slot -- a conductor -- after putting a segment -- a conductor -- it is desirable to have the process which extends the nose-of-cam side of a segment a conductor -- adding the process which extends a nose-of-cam side, although it thinks when deforming, in case a segment is put in a slot -- a conductor -- some conductors within the slot offered by the segment can be certainly arranged to an inner circumference side

[0013] moreover, the conductor which projects from a stator core when the conductor within a slot is made into four -- it is desirable to have the process which joins \*\* at a time within and without [ which met the edge of a segment in the direction of a path ] two just the conductor of every two inside and outside -- since a crevice is formed between the edges of a segment and arrangement of a welding fixture etc. becomes easy, the workability of welding can be raised

[0014]

[Embodiments of the Invention] Hereafter, the AC generator for vehicles of 1 operation gestalt which applied this invention is explained in detail, referring to a drawing.

[0015] Drawing 1 is drawing showing the whole AC-generator composition for vehicles. AC generator 1 for vehicles shown in drawing 1 is constituted including the stator 2, the rotator 3, the frame 4, and the

rectifier 5 grade.

[0016] two or more conductors from which a stator 2 constitutes a stator winding with a stator core 22 -- a segment 23 and a stator core 22 -- each -- a conductor -- it has the insulator 24 which carries out electric insulation of between segments 23

[0017] The rotator 3 has the structure between which each put the field winding 8 which coiled about the copper wire by which insulating processing was carried out the shape of a cylinder, and in the shape of the said heart from both sides through the shaft 6 by the field core 7 which has six claw parts. Moreover, in order to breathe out the cooling wind absorbed from the front side in shaft orientations and the direction of a path, the cooling fan 11 of an axial flow formula is attached in the end face of the field core 7 by the side of a front by welding etc. Similarly, in order to breathe out the cooling wind absorbed from rear \*\* in the direction of a path, the cooling fan 12 of a centrifugal type is attached in the end face of the field core 7 of rear \*\* by welding etc.

[0018] While the frame 4 has held the stator 2 and the rotator 3 and the rotator 3 is supported in the state which can be rotated focusing on a shaft 6, the stator 2 arranged through a predetermined crevice at the periphery side of the field core 7 of a rotator 3 is being fixed. Moreover, the inhalation aperture 41 is formed for the regurgitation aperture 42 of the cooling style [ a frame 4 / the portion which countered the stator winding which projected from the shaft-orientations end face of a stator core 22 ] in the shaft-orientations end face, respectively.

[0019] If the turning effort from an engine (not shown) is told to a pulley 20 through a belt etc., a rotator 3 will rotate AC generator 1 for vehicles which has the structure mentioned above in the predetermined direction. By impressing energizing voltage to the field winding 8 of a rotator 3 from the exterior in this state, each claw part of a field core 7 is excited, a stator winding can be made to generate three-phase-circuit alternating voltage, and a predetermined direct current is taken out from the output terminal of a rectifier 5.

[0020] Next, the detail of a stator 2 is explained. Drawing 2 is the partial cross section of a stator 2. moreover, the conductor from which drawing 3 constitutes a stator winding -- it is the perspective diagram of a segment Drawing 4 is the partial side elevation which developed the stator 2 and was seen from the inner circumference side. Drawing 5 is the partial perspective diagram of a stator 2.

[0021] As shown in drawing 2 , in order to hold the stator winding of a polyphase, two or more slots 25 are formed in the stator core 22. With this operation gestalt, in order to hold the stator winding of a three phase circuit corresponding to the number of magnetic poles of a rotator 3, two or more slots 25 are arranged at equal intervals.

[0022] a stator core -- 22 -- a slot -- 25 -- equipping -- having had -- a stator winding -- plurality -- a conductor -- a segment -- 23 -- joining -- things -- constituting -- having -- \*\*\*\* -- each -- a slot -- 25 -- inside -- \*\*\*\* -- even -- a \*\* (this operation gestalt 4) -- a conductor -- 231 -- a -- 232 -- a -- 232 -- b -- ' -- 231 -- b -- ' -- holding -- having -- \*\*\*\* . in addition, a conductor -- a segment 23 is formed in the shape of U character -- having -- \*\*\*\* -- the two arms (bay) -- it holds in each slot 25 as a "conductor", respectively

[0023] Moreover, four conductors in the slot 25 of 1 are arranged by the single tier sequentially from the inner circumference side about the direction of a path of a stator core 22 in order of inner \*\*\*\*, the inner middle lamella, the outside middle lamella, and the outer edge layer, as shown in drawing 2 . especially -- inner -- \*\*\*\* -- inner -- a middle lamella -- two -- a \*\* -- a conductor -- 231 -- a -- 232 -- b -- inner circumference -- approach -- arranging -- having -- \*\*\*\* -- while -- outside -- a middle lamella -- an outer edge -- a layer -- two -- a \*\* -- a conductor -- 232 -- b -- ' -- 231 -- b -- ' -- a periphery -- approach -- arranging -- having -- \*\*\*\* -- a center -- approach -- inner -- a middle lamella -- outside -- a middle lamella -- two -- a \*\* Moreover, each conductor of inner \*\*\*\*, an inner middle lamella, an outside middle lamella, and an outer edge layer has the conductor width almost equal to the width of face of a slot 25 deducted by the thickness of an insulator 24 to the width of face of the hoop direction of a slot 25, and it is held in a slot 25 so that there may almost be no crevice in a hoop direction.

[0024] the conductor of inner \*\*\*\* within the slot 25 of 1 -- the conductor of the outer edge layer within other slots 25 which left 231a by the pole pitch towards the direction of a clockwise rotation of a stator

core 22 -- 231b and the pair are made the same -- the conductor of an inner middle lamella within the slot 25 of 1 -- the conductor of the outside middle lamella within other slots 25 which left 232a by 1 pole pitch towards the direction of a clockwise rotation of a stator core 22 -- 232b and the pair are made And two conductors which make each pair are connected by going via the turn sections 231c and 232c by using a successive line in one edge of the shaft orientations of a stator core 22. therefore, one edge of a stator core 22 -- setting -- the conductor of an outside middle lamella -- 232b and the conductor of an inner middle lamella -- the successive line which connects 232a -- the conductor of an outer edge layer -- the conductor of 231b and inner \*\*\*\* -- the successive line which connects 231a will surround thus, a pair is made in one edge of a stator core 22 -- each -- the connection of a conductor makes other pairs held in the same slot -- each -- it is surrounded by the connection of a conductor A medium-rise coil end is formed of connection between the conductor of an outside middle lamella, and the conductor of an inner middle lamella, and a \*\*\*\* coil end is formed of connection between the conductor of an outer edge layer, and the conductor of inner \*\*\*\*.

[0025] the conductor of the inner middle lamella within the slot 25 of 1 on the other hand -- as for 232a, conductor 231a of inner \*\*\*\* within the slot 25 besides 1 pole-pitch remote is making the pair towards the direction of a clockwise rotation of a stator core 22 the same -- the conductor of the outer edge layer within the slot 25 of 1 -- the conductor of the outside middle lamella within other slots 25 which left 231b by 1 pole pitch towards the direction of a clockwise rotation of a stator core 22 -- 232b and the pair are made and -- these -- each -- a conductor is connected by junction in the other-end section of the shaft orientations of a stator core 22

[0026] therefore, the other-end section of a stator core 22 -- setting -- the conductor of an outer edge layer -- 231b and the conductor of an outside middle lamella -- the joint which connects 232b, and the conductor of inner \*\*\*\* -- 231a and the conductor of an inner middle lamella -- the joint which connects 232a is located in a line in the direction of a path the conductor of an outer edge layer -- 231b and the conductor of an outside middle lamella -- the connection with 232b, and the conductor of inner \*\*\*\* -- 231a and the conductor of an inner middle lamella -- an adjacent layer coil end is formed of connection with 232a thus, a pair is made in the other-end section of a stator core 22 -- each -- without overlapping, it arranges and the connection of a conductor is arranged

[0027] moreover, the conductor which contains the conductors 231a and 231b of a inner layer edge and an outer layer edge as shown in drawing 3 -- the conductor which the large segment 231 is formed of the segment 23, and contains the inner medium-rise one and outside medium-rise conductors 232a and 232b -- the small segment 232 is formed of the segment 23 Furthermore, a basic segment is formed of these large segments 231 and small segments 232. the large segment 231 and the small segment 232 are held in a slot 25, and are prolonged in accordance with shaft orientations -- it mentioned above -- each -- while having Conductors 231a, 231b, 232a, and 232b, it has the skew sections 231f, 231g, 232f, and 232g which carry out a predetermined angle inclination and are prolonged to shaft orientations These skew sections form the coil end and the ventilation flue is mainly formed among these skew sections.

[0028] the above composition -- all the slots 25 -- each -- a conductor -- it is repeated about a segment 23 and the coil of the turn sections 231c and 232c and an opposite side -- and -- alike -- setting -- the conductor of an outer edge layer -- joint 231e' of a segment 23, and the conductor of an outside middle lamella -- joint 232e of a segment 23, and the conductor of an inner middle lamella -- 232d of joints of a segment 23, and the conductor of inner \*\*\*\* -- it is joined by meanses, such as welding, ultrasonic welding, arc welding, and soldering, and 231d' is connected Coating by the insulating material is performed for the mutual insulation of these joints, and maintenance. In addition, in order to improve vibration-proof nature and a resistance to environment, you may adhere to an insulating material so that a bridge may be constructed in between two or more joints. Moreover, as for an insulating material, it is desirable to make it adhere only to a joint thickly.

[0029] a part for thus, one phase seen from the inner circumference side of a stator core 22 about the stator 2 manufactured -- each -- a conductor -- the segment 23 is shown in drawing 4 and the coil of the turn sections 231c and 232c and an opposite side and the perspective diagram of a group are shown in drawing 5

[0030] In the 1st coil and group 21a corresponding to the turn sections 231c and 232c, a medium-rise coil end and a \*\*\*\* coil end turn into a basic coil end. Moreover, in the 2nd coil of the turn sections 231c and 232c and an opposite side, and group 21b, an adjacent layer coil end turns into a basic coil end. And two or more basic coil ends are arranged repeatedly regularly. A crevice is secured among all coil ends. And each basic coil end is distributed by the density of simultaneously regularity about a hoop direction in an annular coil and a group.

[0031] In both coils and Groups 21a and 21b, a countless ventilation flue is formed among two or more basic coil ends. And those ventilation flues are uniformly distributed about a hoop direction in an annular coil and a group.

[0032] The inner skin of both coils and Groups 21a and 21b has a slightly larger bore than the inner skin of a stator core 22, and is formed. Furthermore, both coils and Groups 21a and 21b have almost fixed height over the perimeter.

[0033] Next, the manufacturing process of a stator winding is explained. first, U character-like two kinds of conductors -- only the number of the slots 25 of a stator core 22 prepares a segment 23 (the large segment 231, small segment 232) the conductor before attaching drawing 6 , drawing 7 , and drawing 8 to a stator 2 -- it is the perspective diagram showing the manufacturing process of a segment 23

[0034] for example, the conductor of the shape of a straight line which has the predetermined length corresponding to the large segment 231 -- a segment 23 is prepared ( drawing 6 ), it bends in the center mostly, and turn section 231c is formed ( drawing 7 ) the conductor formed in the shape of [ this ] U character -- in a segment 23, width of face which met the width of face which met in the direction of a path of turn section 231c in L2 and the direction of a path of a point is set to L3 On both sides of this turn section 231c, a twist is added after that, and 231f of skew sections by the side of turn section 231c is formed. thus, the conductor of the shape of U character which does not have 231g of skew sections by the side of anti-turn section 231c as shown in drawing 3 -- a segment 23 is completed ( drawing 8 )

[0035] the conductor in which 231f of skew sections was formed of this twist -- in the segment 23, while the width of face L2 of turn section 231c is set up more widely than the depth L1 of the slot 25 which met in the direction of a path, the width of face L3 of a point is also wider than the depth L1 of a slot 25, and it is set up moreover, a conductor -- two bays of a segment 23 are held in a different slot 25 which left only the pitch P, respectively, and have the width of face of the hand of cut corresponding to this pitch P Here, in consideration of the thickness of the insulator 24 arranged in the direction of a path of a slot 25 as it was indicated in drawing 2 as the depth L1 of a slot, the slot depth as substantial segment hold space is shown. in addition, the conductor set as  $L1 < L2 = L3$  in drawing 8 -- although the segment 23 was shown --  $L1 < L2$  and  $L1 < L3$  if it is L3, L2 and L3 do not necessarily need to be equal moreover, a conductor -- you may make it set up slightly the width of face of the hand of cut of two bays of a segment 23 widely from Pitch P

[0036] in addition, the conductor of the shape of a straight line which has the predetermined length corresponding to [ the same is said of the small segment 232, and ] the small segment 232 -- the thing which were shown in drawing 6 , drawing 7 , and drawing 8 to the segment 23 and which it bends and is performed for processing and twist processing -- a U character-like conductor -- a segment 23 is completed

[0037] next, it did in this way and was manufactured -- each -- a conductor -- the turn sections 231c and 232c are equal to a same the shaft-orientations side of a stator core 22 side in a segment 23 -- as -- piling up -- each -- a conductor -- a segment 23 is inserted in the slot 25 of a stator 2 this time -- a conductor -- two bays of a segment 23 are held in a different slot 25 which left only the pitch P, respectively by the way, it mentioned above -- as -- a conductor -- the width of face L2 of turn section 231c of a segment 23 and the width of face L3 of a point are put in a slot 25, deforming, since it is set up more widely than both the depth L1 of a slot 25 Even if it is set up so that it may become a plastic region, this deformation may be set up so that it may become an elastic region. even if it is the case where it is set up so that it may become a plastic region -- a conductor -- since there is a springback of a segment 23 -- a conductor -- each of two conductors offered by the bay of a segment 23 is energized at an inner circumference [ of a slot 25 ], and periphery side

[0038] 231d of next, joints located in an opposite side in the coil formed including the turn sections 231c and 232c, and 21 as shown in drawing 5, With the wedge-shaped fixture 160 (is later mentioned about the example of twist processing of a joint) after twisting 232d, 231e, and 232e to an opposite hoop direction mutually and which was formed in a circle While bending 231d of joints corresponding to the conductor of inner \* \*\*, and 232d of joints corresponding to an inner middle lamella to an inner circumference side, processing which bends joint 231e corresponding to the conductor of an outer edge layer and joint 232e corresponding to an outside middle lamella to a periphery side is performed. in addition -- this operation gestalt -- a conductor -- processing which bends each joint which is a point of a segment 23 to an inner circumference and periphery side -- a conductor -- after putting a segment 23 in a slot 25 and twisting the nose-of-cam side, although carried out before welding, before performing this twist processing, you may carry out, or may be made to carry out before the insulating coat formation which it is, is after welding and is mentioned later

[0039] Then, while joining 331d of joints, and 232d of joints by TIG arc welding, joint 231e and joint 232e are joined by TIG arc welding. thus, it was formed -- each -- a conductor -- the joint of a segment 23 is formed so that the height from a stator core 22 may become almost the same

[0040] Next, it pulls up, after arranging a stator 2 so that each joint may become downward, for example, dipping each joint in the insulating material tub of a liquid. An insulating coat is formed in each joint by drying this insulating material.

[0041] drawing 9 -- a stator core 22 -- a U character-like conductor -- after inserting a segment 23, it is drawing showing the outline structure of processing equipment of twisting a joint moreover, the X-X line cross section showing drawing 10 in drawing 9 -- it is -- a conductor -- the edge of a segment 23 was held and it projected from the stator core 22 -- each -- a conductor -- the detail of the twist fixture into which a segment 23 is processed is shown

[0042] After inserting small segment 232c and the large segment 231 which were fabricated by each slot 25 of a stator core 22 in the shape of U character, the periphery section of a stator core 22 is fixed by the clamer 100 which is a restricted fixture. and the work presser-foot fixture 102 and the work receptacle fixture 104 -- the shaft-orientations position of a stator core 22 -- fixing -- each -- a conductor -- the conductor which projected from the end face of a stator core 22 while pressing down so that the turn sections 231c and 232c of a segment 23 might not move to shaft orientations (for example, the shaft-orientations position of the turn sections 231c and 232c is restrained by the end face of the work presser-foot fixture 102) -- the edge of a segment 23 is twisted to opposite direction for each class for example, it is shown in drawing 5 -- as -- an outer edge layer and an inner middle lamella -- each -- the conductor corresponding to the conductor -- the point of a segment 23 twists in the same direction -- having -- an outside middle lamella and inner \*\*\*\* -- each -- the conductor corresponding to the conductor -- the edge of a segment 23 is twisted by opposite direction

[0043] This twist processing is performed using four-fold annular twist fixtures 110, 112, 114, and 116, as shown in drawing 10. Each twist fixtures 110, 112, 114, and 116 the inside of a slot 25 -- an outer edge layer, an outside middle lamella, an inner middle lamella, and inner \*\*\*\* -- each -- the position corresponding to the position where a conductor is arranged -- a conductor, as it has the slots 110a, 112a, 114a, and 116a holding the edge of a segment 23 and is shown in drawing 9 The motor 120 for elevation descent is rotated in the state the bottom, and each twist fixtures 110, 112, 114, and 116 are raised. from the end face of a stator core 22 -- twisting -- processing before -- each -- a conductor -- the edge of a segment 23 -- a protrusion -- each -- a conductor -- the edge of a segment 23 is held by the slots 110a, 112a, 114a, and 116a which are alike, respectively and correspond then, as the arrow showed drawing 10, while rotating the twist fixture 110 of an outer edge layer, and the twist fixture 114 of an inner middle lamella in the direction of a clockwise rotation by motors 140 and 144, maintaining this maintenance state, by motors 142 and 146, the twist fixture 112 of an outside middle lamella and the twist fixture 116 of inner \*\*\*\* were rotated in the direction of a counterclockwise rotation, and it projected from the stator core 22 -- each -- a conductor -- it is processed by twisting to the edge of a segment moreover, the thing for which this twist processing is carried out -- each -- a conductor -- in order that the nose-of-cam position of a segment 23 may displace in the upper part, the shaft 150 for

elevation descent is raised by the motor 120 for elevation descent with advance of twist processing [0044] this twist processing -- setting -- each -- a conductor -- since a part for the point of a segment 23 is held in the slots 110a, 112a, 114a, and 116a formed in each twist fixtures 110, 112, 114, and 116, it remains without adding a twist and this portion is used as joints 231d, 232d, 231e, and 232e for welding shown in drawing 3

[0045] the conductor when forming a stator winding using the processing equipment shown in drawing 9, before being put in a slot 25, since each of the width of face L2 by the side of the turn of a segment 23 and the width of face L3 by the side of a nose of cam is set up more widely than the depth L1 of a slot 25 the conductor corresponding to the conductor of an outer edge layer and an outside middle lamella -- the conductor corresponding to [ the point of a segment 23 inclines toward periphery approach, and ] inner \*\*\*\* and the conductor of an inner middle lamella -- the point of a segment 23 inclines toward inner circumference approach therefore, it was shown in drawing 2 -- as -- inner \*\*\*\* and an inner middle lamella -- each -- a conductor is forced on the opening 26 side of a slot 25 and a conductor -- since the width of face of the hoop direction of a segment 23 is set up so that the crevice between the slots 25 at the time of making an insulator 24 intervene may be filled mostly, it constructs a bridge in the nose of cam of two adjoining teeth 27 -- as -- a conductor -- a segment 23 is arranged and the rigidity of the hoop direction near the nose of cam of teeth 27 can be raised For this reason, even if it is the case where a stator winding vibrates at the time of power generation, about 26 opening [ of each slot 25 of a stator core 22 ] vibration is suppressed, and it can prevent that magnetic sound increases.

[0046] if a crevice is especially formed between an outer edge layer, the conductor of an outside middle lamella and inner \*\*\*\*, and the conductor of an inner middle lamella -- an outer edge layer and an outside middle lamella -- each -- the conductor corresponding to a conductor -- the edges of a segment 23, inner \*\*\*\*, and an inner middle lamella -- each -- the conductor corresponding to a conductor -- it becomes easy to secure the workspace at the time of joining the edges of a segment 23 by welding etc.

[0047] Moreover, even if it is the case where the moisture of salt water etc. reaches the opening 26 of each slot 25 after the pressure by the side of inner circumference had become high with cooling fans 11 and 12 at the time of rotation of a rotator 3 since the inner circumference side opening 26 of each slot 25 is blockaded by the conductor of inner \*\*\*\* as shown in drawing 2, the invasion from the inner circumference side into a slot 25 can be prevented. Therefore, the invasion way of the moisture into a slot 25 can serve as only a crevice portion exposed to the shaft-orientations end face, can reduce sharply the moisture which invades in a slot 25, can reduce the poor insulation produced when moisture invaded in the slot 25, and can raise a resistance to environment.

[0048] in addition, the conductor which constitutes a stator winding from an operation gestalt mentioned above -- although the cross section of a segment 23 was made into the rectangle configuration -- the conductor of other configurations, such as a circular configuration, -- you may make it use a segment moreover, a conductor -- although the case where joined segments and a stator winding was formed was explained, when carrying out the multiple-times volume time of the copper wire which followed each slot 25 and forming a stator winding, it is shown in drawing 11 -- as -- copper wire -- at least -- a part (all [ in drawing 11 ]) -- it is made to incline toward the inner circumference side of a slot, and you may make it blockade near the nose of cam of teeth 27

[0049] moreover -- each -- a conductor -- the case where the copper wire which continued after performing processing which twists a segment 23 is used, into a slot after winding and carrying out a time and completing work -- a conductor -- you may be made to perform processing in which some of segments and copper wire [ at least ] are biased toward an inner circumference side by the handicraft

[0050] Moreover, although the conductor for two-layer [ which formed the crevice in the center of four conductors in a slot 25, and has been arranged from it at the inner layer side ] was biased toward the opening 26 side of a slot 25 with the operation gestalt mentioned above, the conductor of at least one layer or copper wire inclines toward an opening 26 side, and should just be arranged.

[0051] moreover -- the operation gestalt mentioned above -- two conductors -- although the case where two conductors by the side of the inner circumference corresponding to a segment 23 and two conductors by the side of a periphery were distributed to an inner circumference and periphery side

along the direction of a path, respectively was considered -- one conductor -- you may make it distribute one conductor by the side of the inner circumference corresponding to a segment 23, and one conductor by the side of a periphery In this case, each of two conductors held in the slot 25 can distribute to an inner circumference and periphery side.

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[Translation done.]

**\* NOTICES \***

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2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

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**DESCRIPTION OF DRAWINGS**

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[Brief Description of the Drawings]

[Drawing 1] It is drawing showing the whole AC-generator composition for vehicles of 1 operation gestalt.

[Drawing 2] It is the partial cross section of a stator.

[Drawing 3] the conductor which constitutes a stator winding -- it is the perspective diagram of a segment

[Drawing 4] It is the partial side elevation which developed the stator and was seen from the inner circumference side.

[Drawing 5] It is the partial perspective diagram of a stator.

[Drawing 6] the conductor before attaching to a stator -- it is the perspective diagram showing the manufacturing process of a segment

[Drawing 7] the conductor before attaching to a stator -- it is the perspective diagram showing the manufacturing process of a segment

[Drawing 8] the conductor before attaching to a stator -- it is the perspective diagram showing the manufacturing process of a segment

[Drawing 9] a stator core -- a U character-like conductor -- after inserting a segment, it is drawing showing the outline structure of processing equipment of twisting an edge

[Drawing 10] It is the X-X line cross section shown in drawing 9.

[Drawing 11] It is the partial cross section of the stator constituted using a continuous copper wire.

[Description of Notations]

1 AC Generator for Vehicles

2 Stator

3 Rotator

22 Stator Core

23 Conductor -- Segment

24 Insulator

25 Slot

26 Opening

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[Translation done.]

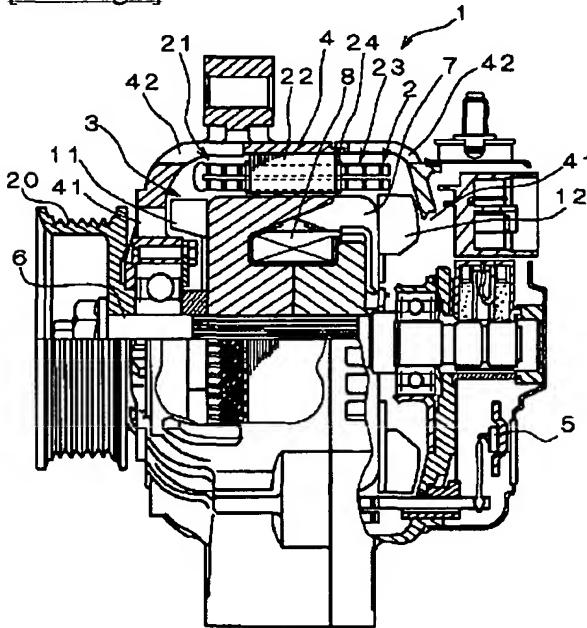
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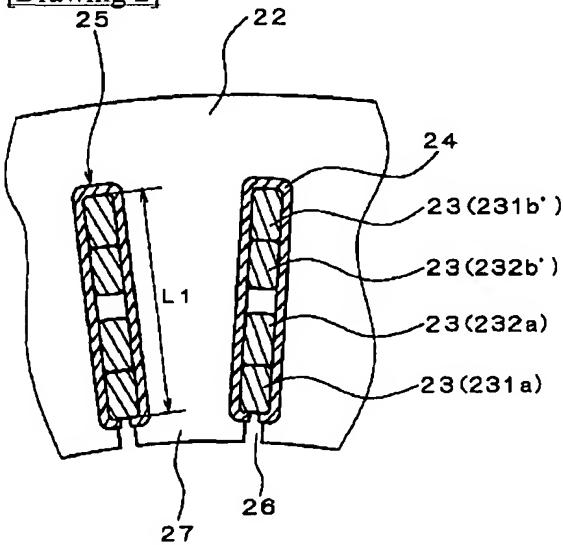
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## DRAWINGS

[Drawing 1]



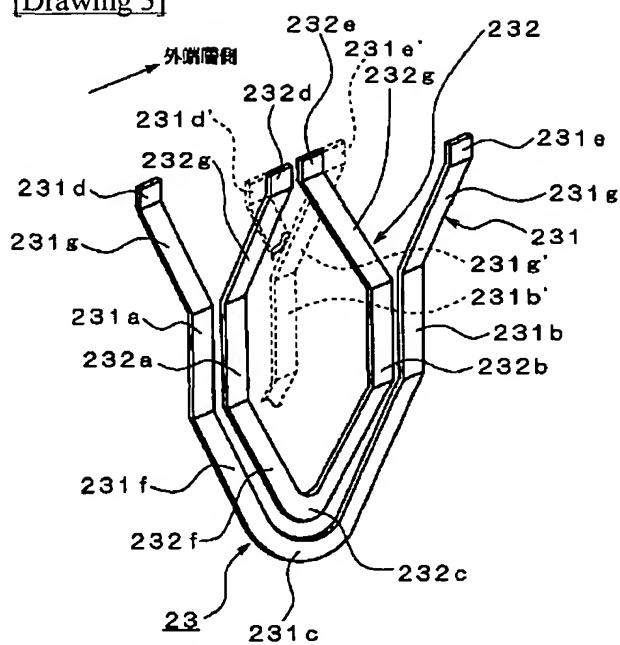
[Drawing 2]



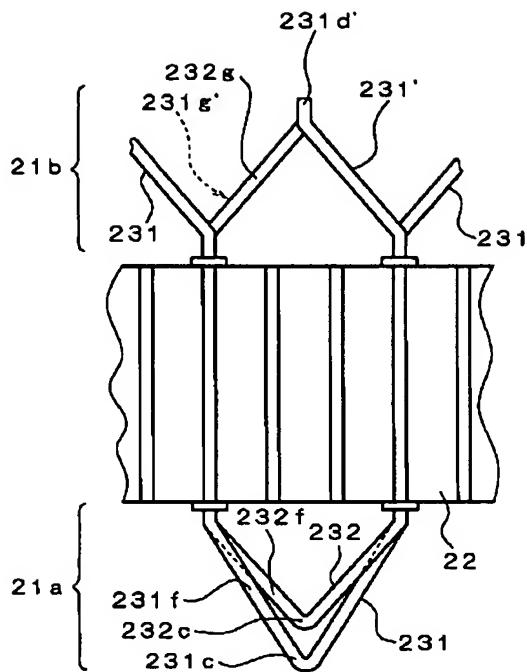
[Drawing 6]



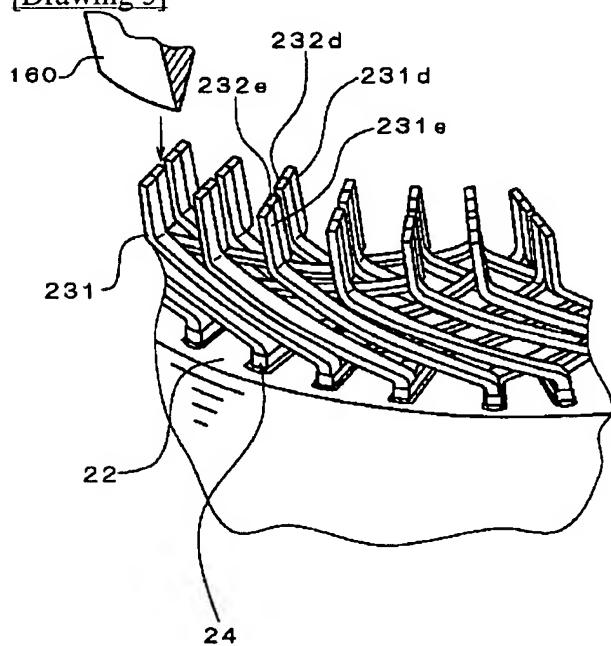
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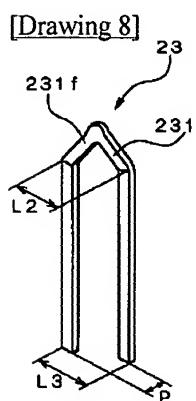
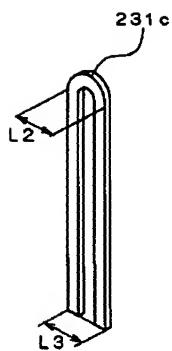
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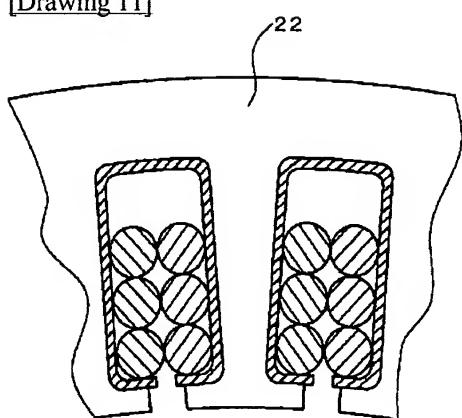
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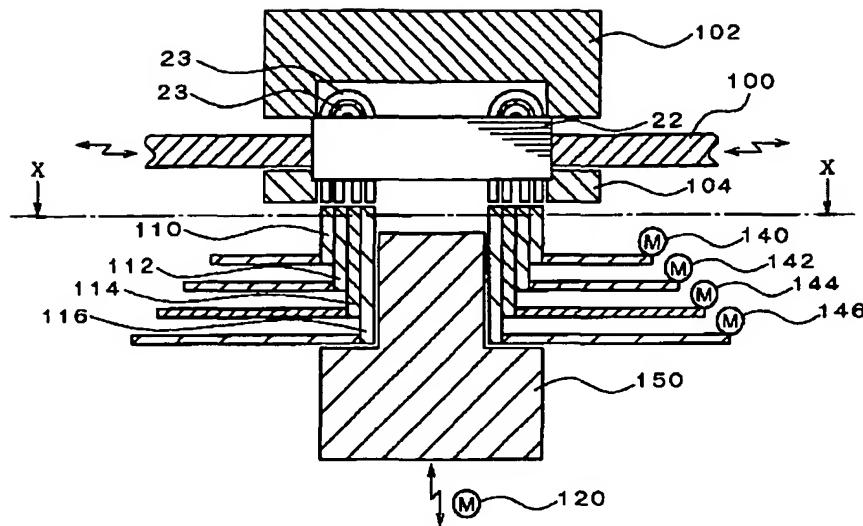
[Drawing 7]



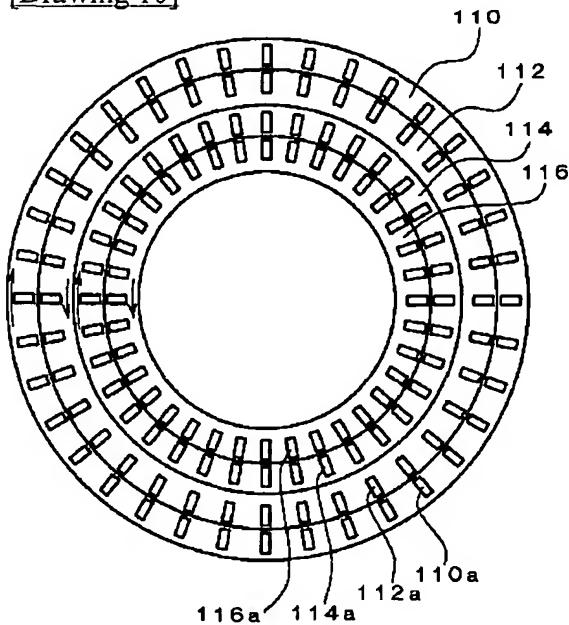
[Drawing 11]



[Drawing 9]



[Drawing 10]



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[Translation done.]